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Service-Oriented Architectures in Net-Centric Operations

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Rapidly changing technology and the nature of military operations today and in the future necessitate a change in the way information is delivered to warfighters. Using a service-oriented architecture and proven acquisition techniques, the Defense Information Systems Agency will make information available to people faster, at reduced cost, and to a greater number of users.

Technology advances such as Web services and policy like the Department of Defense (DoD) data strategy are removing many of the barriers that have traditionally prevented information systems from easily sharing information [1]. *Service-oriented architectures* (SOAs) are frameworks that allow us to better use information by enabling formal and self-organizing communities with common goals or interests to develop and share information. SOAs also provide the ability to update, add, remove, and share information delivering services without having to interrupt or redesign missions or user interfaces. An SOA creates a framework that allows services to be used beneficially in new and powerful ways that could not be envisioned by the service developer. Good business practices aided by a successful SOA helps make an organization agile and eliminates many of the barriers that prevent business processes or mission areas from sharing and reusing information and services.

In the global war on terror, the United States faces an information age adversary. The Internet, wireless technologies, and mass media combined with decentralized organization and off-the-shelf weaponry provide our adversary with unprecedented agility and reach. Response to this threat requires exchange of actionable, high quality, and trusted information on an unprecedented scale. Making this information available requires a strategy that first, makes data visible, accessible, understandable, and trusted, and second, provides services to discover and deliver data securely.

Successful Businesses Get It

By implementing an effective service-oriented strategy, we expect to realize improved information awareness, better and faster decision making, and the ability to rapidly introduce new capabilities. Examples demonstrating the benefits of a successful service-oriented strategy can be found in the commercial world. In his book, "The World Is Flat," Thomas J. Friedman illustrates how an automated process to share information with suppliers increases information awareness and allows retailers such as Wal-Mart to

> ## *"The broad use of information technologies in commercial applications creates an environment where many technologies that meet warfighter needs already exist."*

dramatically reduce its inventories and increase overall efficiency. By effectively sharing information among its business processes, UPS is able to make better and faster decisions, constantly matching the deployment of their shipping to the flow of packages [2]. Low transaction costs allow online retailers, including Amazon and Netflix, to reach broader markets by offering products that stores requiring shelf presence cannot risk holding in their inventories [3]. Both Amazon and Netflix have recommendation services that use customer preferences and shopping habits to help customers discover and purchase niche products that would have otherwise gone unnoticed.

The DoD is no longer the clear leader in the world of information technology [2]. Low entry costs, a commercial market, and the global and egalitarian nature of the Internet have enabled companies and even individuals to develop and use technology faster and more efficiently than the military can. Businesses and private citizens are not constrained by acquisition processes designed to field weapon systems on 10-to-15 year time lines. At times, the current acquisition processes create artificial barriers that slow the acquisition of critical information capabilities.

Our Strategy

We intend to use an acquisition philosophy that improves our speed to market: *adopt before buy*, *buy before create*. This philosophy will allow us to rapidly incorporate capabilities that already exist. If another agency or military service has a solution that either fits or is close to fitting a need, it will be adopted in some fashion or other. If a solution cannot be found within our government, it may be possible to find a commercially available managed service that either fits or is close to fitting the need. In both cases, a risk analysis will determine if a service or capability meets a significant portion of the need. The analysis will identify what elements will not be satisfied and whether or not they are so crucial as to preclude adopting a pre-existing government solution or commercially managed service. It may be cost effective to use a second or third source to satisfy any critical elements that remain. If we cannot adopt or acquire a commercially managed service, we will create or build a solution, but it is our intention to avoid development when possible and turn to others for solutions when we can.

Acquisition oversight, testing, certification, and accreditation functions are required to ensure systems do what they are intended to do and ensure that tax dollars are used effi-

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ciently. By working within this process, we can tailor it to make sure it delivers oversight commensurate with risk. The broad use of information technologies in commercial applications creates an environment where many technologies that meet warfighter needs already exist. They offer capabilities that have been operationally tested through months of use in the business world. We need to examine these capabilities on a case-by-case basis. Well performing, widely adopted offerings do not pose the same risk as new development and do not require oversight that is as expensive or time-consuming. Carefully matching oversight to risk allows our highly trained acquisition experts to focus their effort on higher risk acquisitions and delivers capabilities much faster.

The Defense Acquisition Performance Assessment conducted at the request of the Deputy Secretary of Defense noted that the addition of an *operationally acceptable* test evaluation category has the potential to accelerate delivery of key capabilities. The assessment identified examples where programs formally declared *not operationally effective* by the director of operational test and evaluation proved to be operationally useful in combat situations. Holding capabilities in testing to meet requirements that are not critical to combatant commanders effectively ties the hands of warfighters. We can deliver capabilities incrementally and provide value as soon as it is practical by introducing *schedule* as a key performance parameter, mandating delivery at specified intervals and developing the acquisition processes required to support it.

Again, businesses and individual users have operationally developed and tested capabilities that are applicable to DoD needs. Allowing them to be tested and fielded *as is* leverages commercial technologies and avoids circumstances where less critical requirements prohibit deployment of critical capabilities given appropriate security considerations [4].

We need to develop capabilities and services based on user feedback. Google uses feedback so efficiently that often times users set direction and help establish standards. Google's press center provides the following philosophy for product description:

> …centered on rapid and continuous innovation, with frequent releases of new technologies that we seek to improve with every

iteration. We often make products available early in their development stages by posting them on Google Labs, at test locations online or directly on Google.com. If our users find a product useful, we promote it to *beta* status for additional testing. Our beta testing periods often last a year or more. Once we are satisfied that a product is of high quality and utility, we remove the beta label and make it a core Google product. [5]

This model embodies the speed, agility, and user focus that we need in a net-centric environment. We can meet the rapidly emerging needs of warfighters by using similar models that are fast and user-driven.

> *"By exposing users to services early and incorporating user feedback in the development process, service offerings will either die quickly or be transformed into something useful. User-focused development … is clearly the way ahead."*

The Defense Information Services Agency's Net-Centric Enterprise Services program established an initiative in September 2005 that provides a pre-production environment where users, service providers, and consumers can begin to familiarize themselves with net-centric services. Experimenting with services and capabilities in this way allows technical questions for streamlining the emerging acquisition strategy to be answered without expending the cost, time, and overhead of a traditional DoD program. Services developed like this can be started quickly at much lower costs and can be ended quickly when expectations are not met. By exposing users to services early and

incorporating user feedback in the development process, service offerings will either die quickly or be transformed into something useful. User-focused development like this is clearly the way ahead.

Advantages of a Service-Oriented Architecture

Acquiring capabilities quickly and efficiently is only part of realizing a net-centric operating environment. These capabilities need to be implemented effectively. In adopting the SOA framework, the department will be able to make a set of core services available to all DoD users and developers. Versatile and reusable services with standard interfaces deliver more value than application specific code that *reinvents the wheel* in costly and sometimes unpredictable ways. The services work behind the scenes and act like glue to link and bind business and mission processes. Savvy users and developers can take advantage of these services, reusing them in unique ways and constantly aligning and binding processes to the overall mission. The SOA concept is not about technology; it is about synchronizing our processes to the mission.

Douglas K. Barry presents an example of how information services can reach across devices, business processes, and organizations to improve mission areas. His fictional sales representative is guided through a trip fraught with cancelled appointments and changing circumstances by information services. Machine-to-machine interactions using information services aid in trip planning, send directions to a global positioning system driving assistant in his rental car, update calendars, provide real-time notification of customer-reported problems, book hotels, and schedule flights. Additional information is available to the sales representative through mobile text messaging, palmtop storage, and instant messaging. The character's organization uses an SOA to deliver information from multiple sources both inside and outside of the organization, automatically re-synchronize reservations and appointments in response to changes, and notify the character on a variety of devices [6].

Furthermore, an SOA is in keeping with the fair and open competition that is an important part of the government acquisition policies. Well-defined, government-owned services that govern interaction between services provided

by different vendors would reduce ambiguity, reduce advantages inherent in long-standing contracts, and promote competition. The services can work together, can be produced by different vendors, can be produced and tested independently, and can be replaced without having to replace the entire system. In effect, this reduces information services to commodities. Doing so lowers costs, speeds acquisition, and allows vendors to distinguish themselves by offering superior services instead of watching another vendor charge the government recurring patch and upgrade costs on proprietary code.

Conclusion

Rapid acquisition practices that provide oversight commensurate with risk are key to taking advantage of capabilities that, as a result of the Internet, are developed and adopted by businesses and individuals at an increasingly higher rate. SOAs provide a framework to apply new capabilities in ways that improve both individual processes and the way processes contribute to the overall mission. Businesses that *get it* have translated a strategy combining rapid acquisition and an SOA framework into industry leadership and greater success. The talent and creativity of the men and women in the department should be able to transfer these benefits to our military if we allow them.

The combined efforts of the Office of the Secretary of Defense, the Combatant Commands, the Joint Staff, military service chief information officers, and combat support agencies are required to match our acquisition processes to our environment, harness information with an SOA, and achieve net-centricity. We have and will continue to work together to change our processes to provide individuals who have chosen to defend their country every possible advantage.◆

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